

## **Historic, archived document**

Do not assume content reflects current scientific knowledge, policies, or practices.

#1186  
Ag 84F  
C. 3

S

C & F Veg #1186

# POPCORN



Farmers' Bulletin No. 1679

UNITED STATES DEPARTMENT OF AGRICULTURE

## Contents

	Page
Varieties and hybrids .....	1
Soils, rotations, and fertilizers .....	4
Planting and cultivating .....	5
Harvesting .....	6
Drying .....	8
Storing .....	8
Moisture determination .....	10
Popping expansion .....	10
Kernel structure .....	10
Moisture .....	11
Kind of popper and seasoning .....	11
Temperature of popper .....	11
Size and shape of containers .....	12
Marketing .....	12
Diseases and insects .....	17

Washington, D. C.

Revised April 1958

# POPCORN

By **ARTHUR M. BRUNSON**, *agronomist, Crops Research Division, Agricultural Research Service*, and **DEWAYNE L. RICHARDSON**, *geneticist, Purdue University Agricultural Experiment Station*<sup>1</sup>

Popcorn was evidently grown by the Indians of both North and South America before the coming of the white man. However, the crop has been important commercially only since about 1890, and its popularity has increased greatly since 1940.

The use of popcorn confections, the rapid increase in popcorn concessions at amusement parks and motion-picture theaters, and the development of the small electric popper for use in the home have greatly increased the demand for popcorn and have made a profitable outlet for those who wish to grow the crop on a commercial scale. Although popcorn is still grown in the family garden for home and local consumption, its greater use in cities probably will make commercial production increasingly important, particularly with the development of improved hybrids.

The commercial crop is produced mainly in Illinois, Indiana, Iowa, and Ohio. Iowa was for many years the leading State, but Indiana has had the highest annual acreage and production of popcorn during 1950-56.

In areas of regular commercial production popcorn probably pays the successful grower about as well as field corn. Where popcorn is not produced regularly in commercial

quantity, however, the difficulties of marketing advantageously reduce the chances of success.

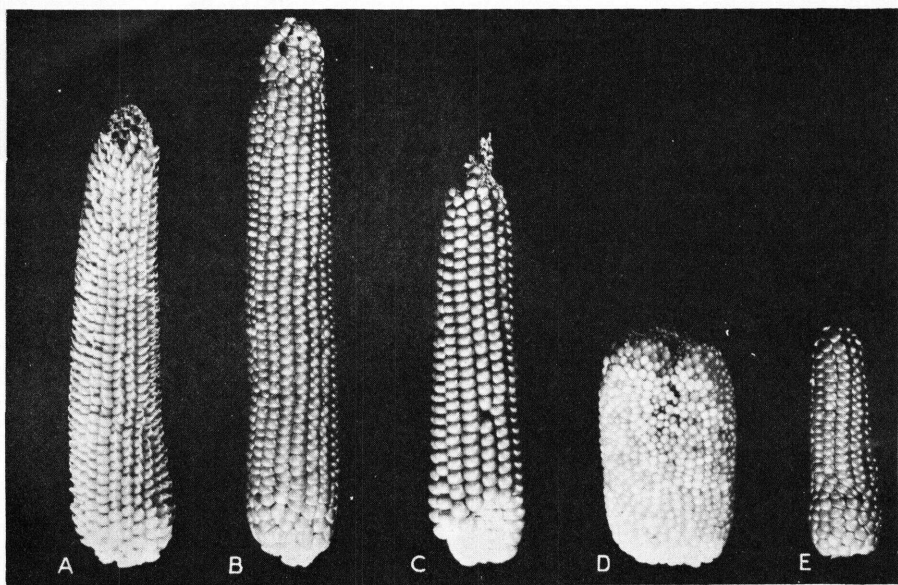
Profit in growing popcorn on a small scale to meet a local demand will depend on the grower's ability both as a producer and as a merchant. He must, of course, produce economically a crop of good quality. To develop direct sales in competition with others, he must first carefully store and process the product and then so prepare it for market that it will retain its quality and be attractive.

## Varieties and Hybrids

Before the early 1940's only open-pollinated varieties of popcorn were grown commercially. South American, Supergold, and Queen Golden were the leading yellow varieties and White Rice and Jap Hulless the principal white varieties. A number of synonyms and local names were given to these varieties and their selections. In addition, several distinct varieties were used in gardens for horticultural novelties, such as Tom Thumb, Strawberry, Lady Finger, and Squirrel Tooth. (Figs. 1 and 2.)

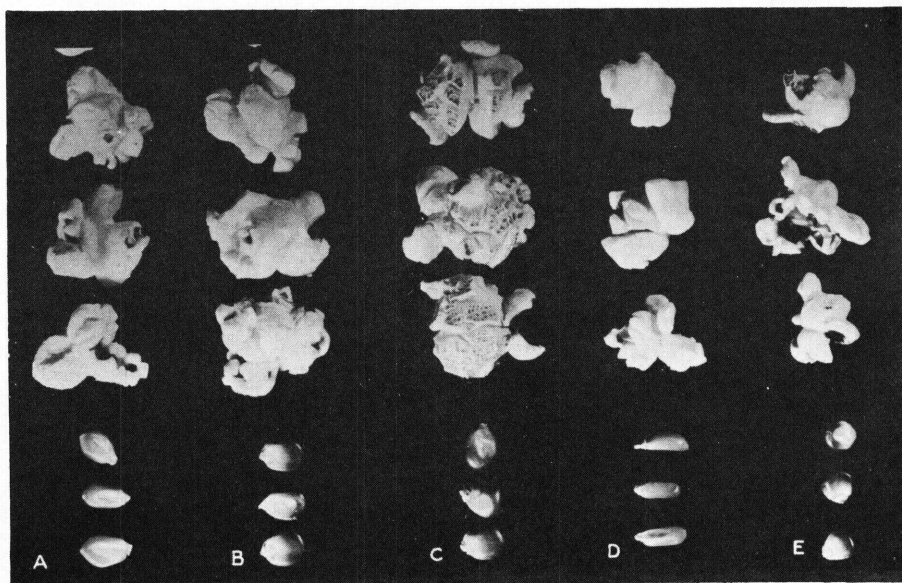
---

<sup>1</sup> The previous edition of this bulletin was prepared by Arthur M. Brunson and Glenn M. Smith, Crops Research Division.



PN-440

FIGURE 1.—Ears of five varieties of popcorn: *A*, White Rice; *B*, Queen Golden; *C*, South American; *D*, Jap Hulless; *E*, Tom Thumb.



PN-441

FIGURE 2.—Popped and unpopped kernels of five varieties of popcorn: *A*, White Rice; *B*, Queen Golden; *C*, South American; *D*, Jap Hulless; *E*, Tom Thumb.

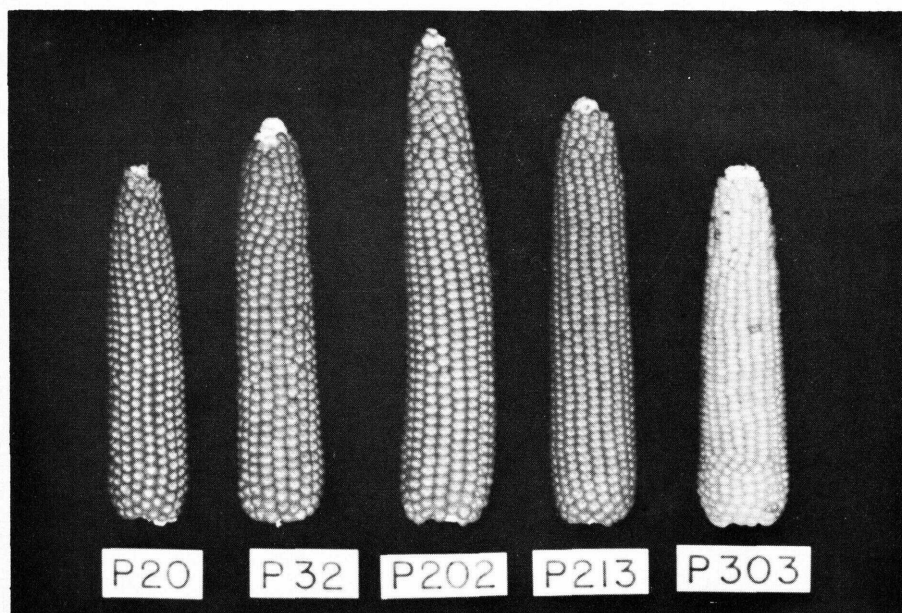


FIGURE 3.—Ears of five popcorn hybrids.

PN-442

Popcorn hybrids (fig. 3) have replaced the open-pollinated varieties in the same way that dent corn hybrids replaced their open-pollinated varieties about 10 to 12 years earlier. The change came so quickly that hybrid popcorn was grown almost exclusively for the commercial crop by the late 1940's. Bred and introduced by a few agricultural experiment stations and the United States Department of

Agriculture, the popcorn hybrids were accepted immediately because of their improved yield, standing ability, popping expansion, and quality. Later several hybrids with proprietary pedigrees were introduced by commercial seed companies.

Table 1 shows the open-pedigreed popcorn hybrids approved by some of the State agricultural experiment stations.

TABLE 1.—*Pedigree, color, type, and maturity of open-pedigreed popcorn hybrids approved by various State agricultural experiment stations, 1956*

Hybrid	Pedigree	Color and type	Maturity
PURDUE UNIVERSITY (INDIANA) AGRICULTURAL EXPERIMENT STATION <sup>1</sup>			
Purdue 20-----	Sg18 × Sg30A-----	Yellow pearl--	Medium.
Purdue 22-----	Sg16 × Sg18-----	do-----	Do.
Purdue 31-----	(Sg16 × Sg18) × SA24-----	do-----	Medium late.
Purdue 32-----	(Sg18 × Sg30A) × SA24-----	do-----	Do.
Purdue 202-----	A1-6 × SA1490-----	do-----	Medium.
Purdue 213-----	(Sg18 × Sg1533) × Ia28-----	do-----	Do.
Purdue 303-----	(Ia27 × Ia29) × WR4533-----	White rice----	Do.
Purdue 406-----	(Sg18 × Sg1533) × KP58-----	Yellow pearl--	Medium late.

See footnote at end of table.

TABLE 1.—*Pedigree, color, type, and maturity of open-pedigreed popcorn hybrids approved by various State agricultural experiment stations, 1956—Continued*

Hybrid	Pedigree	Color and type	Maturity
IOWA AGRICULTURAL EXPERIMENT STATION			
Iopop 5.....	(Ia5 × Ia12)(Ia11 × Ia15).....	White rice....	Medium early.
Iopop 6.....	(Sg18 × Sg30A) × Ia28.....	Yellow pearl..	Medium.
Iopop 7.....	(Ia5 × Ia12)(Ia27 × Ia29).....	White rice....	Medium early.
Iopop 8.....	(Sg18 × Sg30A)(Ia28 × Ia61).....	Yellow pearl..	Medium.
Iopop C-2.....	(Sg18 × Sg30A)(Ia56 × Ia62).....	do.....	Medium late.
KANSAS AGRICULTURAL EXPERIMENT STATION <sup>1</sup>			
K4.....	(Sg18 × Sg30A) × SA24.....	Yellow pearl..	Medium late.
MINNESOTA AGRICULTURAL EXPERIMENT STATION			
Minhybrid 250..	C1-29 × C6-29.....	White hullless..	Very early.
Minhybrid 251..	(P1 × P5)(P18 × P40).....	Yellow hullless..	Early.
Minhybrid 252..	P18 × P40.....	do.....	Do.
NEBRASKA AGRICULTURAL EXPERIMENT STATION			
Nebr. 104.....	(Sg18 × Sg30A) × N42.....	Yellow pearl..	Medium late.
Nebr. 131.....	(Sg16 × Sg18) × N42.....	do.....	Do.

<sup>1</sup> Also U. S. Department of Agriculture.

Similar in behavior to dent corn, the second generation of popcorn hybrids yields much less than the first. In fact, yield reductions are even more pronounced than in dent corn, because many popcorn hybrids are single or three-way crosses, which suffer more serious declines in the second generation than the double crosses commonly used in dent corn. Comparisons of first- and second-generation seed of a number of popcorn hybrids for 2 years at the Purdue University Agricultural Experiment Station showed reduced yields of 20 to 50 percent when the second-generation seed was used. The Federal Seed Act and the seed laws of several States make it un-

lawful to label second-generation seed as hybrid seed.

### Soils, Rotations, and Fertilizers

Popcorn may be grown on any soil that will grow good field corn. However, production should be restricted in general to the more fertile soils that are not too light and sandy, where the crop can mature fully and produce a high-grade product.

Crop rotation is even more important for popcorn grown regularly than for field corn. The smaller popcorn plants do not shade out the late weeds, so that the land soon becomes foul unless the crops are rotated.

In most parts of the Corn Belt, especially in the eastern sections, mineral fertilizers can be used to advantage for a corn crop. The three principal methods of utilizing commercial fertilizers are (1) row or hill application at the time of planting, (2) plow-sole fertilization, and (3) fertilizing the preceding leguminous green-manure crop. Fertilizers high in phosphorus are particularly valuable in hastening popcorn development and making complete maturity more certain. The best rotation and fertilizer treatments for popcorn depend largely on local conditions. Recommendations by the State agricultural experiment stations for field corn production in any given area are applicable also to popcorn.

## Planting and Cultivating

The usual methods for successful field corn culture apply also to popcorn, with slight modifications. In the western part of the Corn Belt, particularly in Nebraska and Kansas, where field corn generally is listed, popcorn also is usually listed. A favorable practice there is to blank-list in the fall, throw in the ridges about 2 weeks before planting, and at planting time nose out the old furrows with a loose-ground lister or a furrow-opener attachment on the corn planter (fig. 4). This method has two advantages—it kills cheaply two crops of early weeds and provides a warmer and mellowed seedbed than ground freshly listed.



FN-443

FIGURE 4.—Unplowed field planted with a lister. Unless the ridges are first thrown in and then nosed out, the seedbed frequently will be cold and cloddy.



PN-444

FIGURE 5.—Popcorn planted in checkrows.

On plowed land popcorn may be checkrowed (fig. 5) to permit better cultivation. The rows, especially for the smaller varieties, should be somewhat closer together than for field corn. The rate of planting depends on the variety, character of the soil, normal rainfall, and other conditions. In general, the optimum rate will provide for  $1\frac{1}{4}$  to  $1\frac{3}{4}$  times as many plants per acre as field corn should have in the same locality. From 3 to 6 pounds of popcorn seed is required to plant an acre, varying with the size of seed and the rate of planting.

Corn planters fitted with disk furrow openers are excellent for planting popcorn on plowed ground (fig. 6). The popcorn seedlings are small and grow slowly to a size suitable for cultivation. Planting with furrow openers allows early weeds to be killed cheaply with a harrow and without injury to the small corn plants.

Popcorn can be planted slightly earlier than field corn, as the hard, corneous seed is not so easily dam-

aged if the weather turns cold and wet. Early planting is recommended in most localities to give the crop ample time to mature normally and thoroughly.

The primary purpose of cultivating corn is to control weeds. Both the yield and the quality of popcorn are injuriously affected by weed growth. The smaller stalks of popcorn cannot compete so well with weeds as field corn. The three principal practices that help to control weeds are (1) suitable rotations, (2) early and careful preparation of the ground, and (3) thorough cultivation.

## Harvesting

Harvesting is one of the most tedious tasks in popcorn production if hand labor is used. Practically all commercial acreage is now husked with mechanical pickers (fig. 7). Special popcorn rollers that greatly facilitate the operation of machines are available for most makes of pickers.



PN-445

FIGURE 6.—Plowed field planted with a furrow-opener attachment on the planter.



PN-446

FIGURE 7.—Most popcorn is now harvested with mechanical pickers.

Popcorn should not be harvested until the moisture is down at least to 20 percent and preferably to 15-17 percent (see p. 10). Complete normal maturity of the crop before the first killing frost is essential for the best quality and allows the grain to dry satisfactorily on the stalk before cribbing.

## Drying

In the southern Great Plains and frequently along the southern edge of the Corn Belt, popcorn will dry in the field to approximately the correct moisture content for best popping. However, in the central and northern sections of the Corn Belt there are relatively few years when it reaches this condition at husking time. Artificial drying is enabling farmers to move the corn at once into market channels and thus avoid the expense of keeping the large inventories an unnecessarily long time.

Many farmers have had unfortunate experiences with artificial drying, ranging from slight deterioration to total loss of popping ability, which were probably caused by too rapid drying. It is generally recognized that rapid loss of moisture reduces popping expansion. For producing the highest quality product many popcorn growers believe there is no substitute for slow natural curing on the stalk or in the crib. Experimental work under controlled conditions is needed to give information on which satisfactory drying methods can be based. In the absence of such information it is probably safe to operate driers so that ear corn will not lose more than 1 percent of moisture per day, or if artificial heat is used, to limit temperatures to not more than 90° F. When drying bins through which heated air has been circulated are emptied, moisture will usually be found to be unevenly distributed, with the corn

in the bottom appreciably drier than that at the top. Corn that has been heated in drying will continue to dry until the bin has entirely cooled.

## Storing

Popcorn should be stored on the ear at least until it is in good popping condition, preferably until shortly before using. Since popcorn is used as human food, special precautions must be taken to prevent damage by rats and mice while it is in storage. Officials of the Food and Drug Administration may condemn as unfit for popping any lot of corn fouled by rodents.

Storage facilities necessary in any locality depend on the normal moisture content of the corn at harvest and on the weather thereafter. Where considerable drying in the crib is necessary, cribs 4 feet wide are advisable (fig. 8). If cribs are wider, temporary partitions or air tunnels (fig. 9) are frequently used to provide the ventilation needed for proper curing. Directions for the construction of various types of corn-crib ventilators are given in Farmers' Bulletin 1976, *Handling and Storing Soft Corn on the Farm*. Directions for the construction of rodentproof cribs may be obtained from most State agricultural experiment stations. The storage cribs of some of the large popcorn companies in centers of commercial production are models of satisfactory design and sound construction.

When ear corn is stored, it should be reasonably free from husks, silks, and shelled grain, particularly if the moisture content tends to be high. All diseased, immature, and off-type ears should be culled as the corn goes into the crib. If protected from rodents and not infested with storage insects, well-matured ear corn may be stored in a good crib for 3 or 4 years without apparent loss in popping quality.



PN-447

FIGURE 8.—Mechanical elevators are widely used in cribbing popcorn. It should be stored in narrow cribs to facilitate drying.



PN-448

FIGURE 9.—Movable A-shaped ventilators in a popcorn crib. The foreground sections have been removed to show the construction. These ventilators should extend the entire length of the crib to provide a free circulation of air.

## Moisture Determination

Both the keeping quality and the popping volume of popcorn depend on its moisture content. Growers, therefore, should have access to a satisfactory means of moisture determination.

The official standards for corn specify that the percentage of moisture shall be ascertained by the water-oven method or any other method that gives equivalent results. The official standards for the small grains, on the other hand, specify that the percentage of moisture shall be ascertained by the air-oven method. These two methods yield appreciably different results with corn and thus cannot be used interchangeably. The moisture content of corn as determined by the air-oven method is usually about 1.5 percent higher than that determined by the water-oven method.

Since the advent of the electric moisture meters, such as the Tag-Heppenstall and Steinlite, these machines are used almost universally for ascertaining the moisture content of popcorn. The conversion tables for corn and popcorn supplied with these machines are arranged to give moisture percentages equivalent to those determined by the official water-oven method. The directions given with these machines must be followed carefully and the proper conversion tables must be used to obtain accurate results. It is a good plan to have the moisture determinations on occasional samples checked by official tests at a State or Federal grain-grading laboratory.

The Brown-Duval method is not satisfactory for popcorn. If the corn is heated rapidly, it pops in the oil and fills the flask; if it is heated slowly to avoid popping, the determinations of moisture percentage may be too low.

## Popping Expansion

Popping expansion is the ratio of the volume of corn after popping to that before popping. Thus, if a pint of unpopped corn increases in volume to 30 pints after popping, the corn is said to have a popping expansion of 30. This is probably the most valuable measure of quality used by the trade.

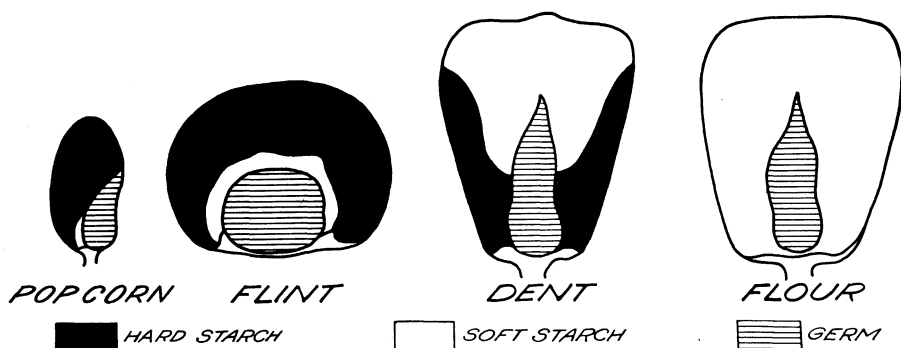
The quality of popcorn depends on its flavor and tenderness. A large expansion during popping is closely associated with tenderness and is desirable also because it means a large volume of the finished product from a given quantity of the kernels.

Popping expansion depends on three major conditions—the inherent structure of the kernels, their moisture content, and the proper application of heat. Other important factors affecting popping expansion and its measurement include the kind of popper and the seasoning, the temperature of the popper, and the size and shape of the containers.

## Kernel Structure

All starchy corns fall into one of four classes—popcorn, flint corn, dent corn, or flour corn—on the basis of the distribution and content of hard and soft starch. The starchy portions of the kernels of the best strains of popcorn are hard throughout or contain only a small core of soft starch near the center (fig. 10). Flint corn consists of a small quantity of soft starch completely surrounded by hard starch. Dent corn has more soft starch, and the hard starch is mainly at the sides of the kernels. Flour corn is practically all soft starch with only traces of the hard.

Popping is due to the sudden release of pressure produced by steam generated within the kernel.



FN-449

FIGURE 10.—Location and relative proportions of hard and soft starch in the four main classes of starchy corn.

The source of this steam is the moisture contained in the kernel. The popping properties of the different kinds of corn follow rather closely the relative proportion of hard starch in each. Popcorn with the most hard starch is far better than the others in poppability. Flint corn may pop fairly well, depending on the strain; dent corn seldom will pop, though occasionally a few kernels will pop feebly; and flour corn will not pop at all. Just as popcorn pops better than flint corn, so popcorn having the least soft starch in the kernels pops best. This freedom from soft starch is probably the most important feature determining the popping expansion of different strains.

### Moisture

Moisture contents from 11 to 15 percent have been recommended for giving the highest popping volume. The disagreement in recommendations may be due partly to difficulties of the various workers in determining moisture content accurately and partly to differences in the kind and temperature of the popper used, the quantity of seasoning, and other factors. Experience indicates that popcorn pops best when a standard electric popper and a moderate quantity of seasoning are used, and the popcorn has approximately 13½ percent of mois-

ture, as determined by the Tag-Heppenstall moisture meter. A slightly higher moisture content is suitable when a wire popper is used. Drier samples should probably have higher popping temperatures than the more moist, although here again further information obtained under carefully controlled conditions is needed. Popcorn that is too dry pops with a smooth fracture, as contrasted with a slightly roughened surface at the correct moisture content and a rough surface when too moist.

### Kind of Popper and Seasoning

Popcorn may be popped dry in a wire popper or with an oil seasoning in a tight-bottomed container. Most commercial seasonings have a coconut-oil base and contain artificial coloring. Any good shortening or vegetable oil may be used in the home. The usual proportion is 10 to 20 percent as much seasoning as unpopped corn, depending on personal preferences and the availability of fats.

### Temperature of Popper

Thermostatically controlled electric poppers are adjusted at the factory to maintain a constant temperature while in operation. The temperature of those without

thermostats can be regulated somewhat by varying the size of the charge. Gas-heated poppers are controlled by varying the size of the flame. When an unshielded gas flame is used, slight drafts or air currents may make a considerable difference in the temperature of the popper and consequently may give variations in successive poppings of samples from the same lot of corn. Regulation of heat is largely a matter of experience, but under most conditions temperatures that will start the popping in 60 to 90 seconds give the best results.

### ***Size and Shape of Containers***

Any determination of popping expansion requires that the volume of the corn be measured before and after popping. The size and shape of the containers and the method of filling them may affect the results considerably. Measures with square corners and those unusually tall and narrow may have considerable waste space when apparently full.

In 1946 the National Association of Popcorn Manufacturers and the Popcorn Processors Association collaborated on the development of a standard machine and method for the determination of popping expansion. The equipment consists of measures for unpopped corn and seasoning, a graduated tube for direct reading of expansion, and a thermostatically controlled electric popper mounted on a frame. The general use of this expansion tester has done much to standardize popping determinations throughout the country.

In 1956 the Popcorn Processors Association announced a revised weight-volume tester. The previous official tester gave the volume expansion ratio of popcorn when popped. The new tester uses a unit of weight rather than a unit of volume of unpopped corn, and the popped corn is expressed as cubic inches from a pound of raw popcorn.

## **Marketing**

As with most specialized crops, marketing is an important factor in determining whether popcorn is to return a profit. Three main outlets are open—local sale, contracted acreage, and selling on the open market.

Local or specialized sale is possible for growers who live near cities and where little popcorn is raised. With a little judicious advertising, a product of high and uniform quality will frequently find a ready market in a nearby city. It may even stimulate consumption and so develop a greater demand. One grower in Oregon, who has built up a reputation for quality, retails his entire crop each year to customers who call for it at the farm. The essentials for success in making local sales include (1) growing a high-quality variety, (2) getting proper moisture content, (3) sorting out diseased and moldy ears before shelling, (4) carefully shelling and cleaning the corn, and (5) using clean, attractive sacks or packages. Growers who are careless about one or more of these points do not fully satisfy direct-sales retail customers.

Much of the commercial popcorn acreage is always contracted for in advance by large popcorn companies and seed houses. This tends to stabilize the market and to guarantee a reasonable profit to both grower and jobber. The contract usually calls for delivering the entire crop on the ear to a designated shipping point or elevator (fig. 11) at a fixed price per pound. As part of its contract the company frequently furnishes the seed from which the crop is to be grown.

The grower who does not contract his crop in advance assumes the risk of fluctuation in price. When the crop happens to be short or the demand increases, bringing higher prices, he may make a substantial profit. On the other hand, if a

considerable surplus is in sight at harvesttime, the free-lance grower will find buyers indifferent about taking noncontracted corn and be forced to sell at distress prices.

The popcorn acreage could easily be expanded to a point where production would become unprofitable. Only a year or two of relatively high popcorn prices or of relatively low field corn prices or both will tempt the regular growers of popcorn to increase their acreage. In addition, they have to compete with a host of new growers, attracted by stories of large profits of friends and neighbors. The results are overproduction, low prices, and losses.

The large popcorn companies keep in close touch with the current acreage and crop conditions, as well as with the probable market demand and carryover. They then regulate the prices for cash corn and their bids for contracted acreage accordingly. The small grower, by keeping informed on fluctuations in current cash prices and particularly on the prices for the product from acreages contracted for the coming season, will know about market conditions and can make his plans accordingly. It is usually unwise, especially for the amateur popcorn grower, to plant a large

acreage immediately following a year of high prices. The chances are that many others will do the same thing, with the result that the market will be flooded and prices will drop disastrously.

Since there are no standard grades for popcorn, generally popping expansions for bulk retail samples under 25 volumes may be considered poor, 25 to 30 fair, 30 to 35 good, and 35 or more excellent. Although expansion is usually considered in marketing popcorn, it should be given even more weight in determining the price. Some system of premiums for high-popping samples similar to the premiums paid for high-protein wheat could easily be worked out. The bulk of the popped corn, the end product, varies with popping expansion. Even more important, the tenderness and quality of the best popping corns are usually superior—a double advantage for the samples with high expansion.

Only 11 States are listed separately as important in producing commercial popcorn during 1944-56 by the United States Department of Agriculture. Estimates of acreage harvested, yield per acre, and production in these States are shown in tables 2-4.

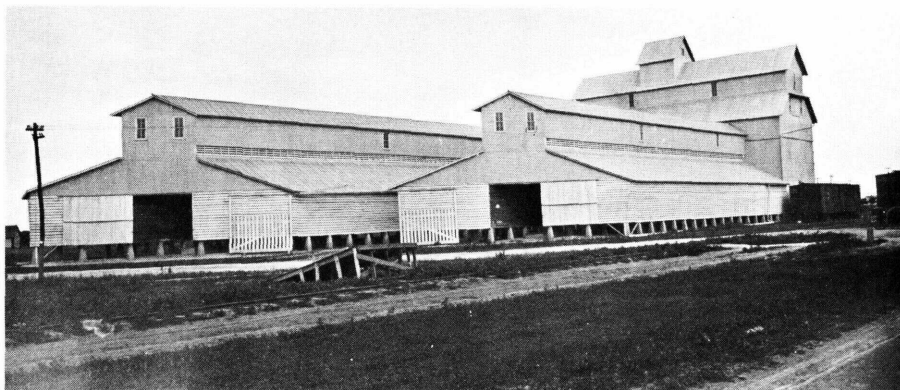


FIGURE 11.—Popcorn elevator and storage cribs.

PN-450

TABLE 2.—*Acres of popcorn harvested in certain States, 1944-56*<sup>1</sup>

Year	Ohio	Indiana	Illinois	Michigan	Iowa	Missouri	Nebraska	Kansas	Kentucky	Oklahoma	Texas	California	Other States <sup>2</sup>
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1944	13,000	17,700	19,500	2,400	50,300	11,500	8,700	5,700	13,500	18,000	12,500	2,000	-----
1945	30,000	34,800	24,800	3,500	92,000	15,000	33,000	8,400	14,400	38,000	14,000	2,000	-----
1946	14,100	18,800	15,800	2,600	41,000	15,000	13,000	5,200	10,100	13,000	4,200	1,600	-----
1947	5,000	7,300	20,400	2,100	15,000	10,000	4,000	3,500	6,500	5,000	2,700	2,000	-----
1948	21,000	16,500	29,300	3,800	26,000	11,000	5,000	3,000	15,500	24,000	4,100	1,000	-----
1949	9,500	14,400	18,000	2,800	23,000	10,200	6,000	3,800	9,500	7,000	2,000	-----	9,600
1950	13,000	17,600	24,600	2,600	26,000	16,000	10,000	6,500	11,300	13,000	3,400	-----	10,400
1951	13,000	17,600	24,400	2,300	14,000	10,000	10,000	4,100	19,400	19,000	1,700	-----	10,500
1952	15,000	30,000	28,000	3,200	21,000	14,000	12,000	8,200	26,800	10,000	2,400	-----	14,900
1953	17,000	40,000	35,000	3,400	29,000	15,000	17,500	8,200	32,700	3,000	3,900	-----	21,200
1954	14,600	30,000	25,500	3,200	29,000	9,200	13,500	6,200	16,000	2,000	1,400	-----	11,200
1955	16,500	31,000	22,000	3,500	24,000	12,500	11,500	3,200	13,000	1,000	2,400	-----	10,100
1956 <sup>3</sup>	19,000	40,000	23,000	4,400	26,000	12,500	11,000	4,900	17,300	1,000	4,400	-----	8,400
Average 1945-54	15,220	22,700	24,580	2,950	31,600	12,540	12,400	5,710	16,220	13,400	3,980	-----	12,967

<sup>1</sup> Data from Crop Reporting Board, Agricultural Marketing Service, U. S. Department of Agriculture.<sup>2</sup> Include Delaware, Maryland, Tennessee, Alabama, Idaho, and Colorado. Short-time average.<sup>3</sup> Preliminary.

TABLE 3.—Yield of popcorn in certain States, 1944-56 <sup>1</sup>

Year	Ohio	Indiana	Illinois	Michigan	Iowa	Missouri	Nebraska	Kansas	Kentucky	Oklahoma	Texas	California	Other States <sup>2</sup>
	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre	Pounds per acre
1944	1,450	1,325	1,200	1,200	1,700	1,680	1,400	1,400	1,000	800	950	700	---
1945	1,800	1,975	1,800	1,200	1,130	1,680	1,350	1,100	1,400	850	850	600	---
1946	1,750	1,900	1,800	1,400	1,820	1,600	1,500	1,200	1,470	910	1,200	1,000	---
1947	1,600	1,500	1,400	1,000	960	1,100	1,200	950	1,470	1,000	1,300	850	---
1948	2,350	2,500	2,250	2,000	2,110	2,100	1,800	1,650	1,610	780	1,150	1,100	---
1949	1,900	1,900	1,700	1,650	1,470	1,300	1,430	1,360	1,350	1,250	1,000	---	1,865
1950	2,000	1,900	1,750	1,700	1,560	2,000	1,650	1,750	1,490	1,250	1,070	---	1,657
1951	1,900	2,050	1,900	1,860	1,610	1,500	1,500	1,000	1,240	650	850	---	1,875
1952	2,000	1,925	1,500	2,100	2,350	1,600	2,200	1,190	620	570	600	---	1,635
1953	2,100	1,860	1,650	1,750	1,860	1,500	1,750	820	1,170	900	1,000	---	2,488
1954	2,200	1,900	1,400	2,000	1,500	1,000	1,400	900	860	750	1,000	---	1,547
1955	2,250	1,900	1,500	1,700	1,400	1,400	1,100	1,150	1,300	800	1,000	---	2,062
1956 <sup>3</sup>	2,300	2,200	2,100	2,000	1,400	2,000	1,750	900	1,620	800	1,130	---	2,093
Average 1945-54	1,960	1,941	1,715	1,666	1,637	1,538	1,578	1,192	1,268	891	1,002	---	1,844

See footnotes for table 2.

TABLE 4.—*Production of popcorn in certain States, 1944-56*<sup>1</sup>

Year	Ohio	Indiana	Illinois	Michigan	Iowa	Missouri	Nebraska	Kansas	Kentucky	Oklahoma	Texas	California	Other States
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
1944	18,850	23,452	23,400	2,880	85,510	19,320	12,180	7,980	13,500	14,400	11,875	1,400	---
1945	54,000	68,730	44,640	4,200	108,960	25,200	44,550	9,240	20,160	32,300	11,900	1,200	---
1946	24,675	35,720	28,440	3,640	74,620	24,000	19,500	6,240	14,847	11,830	5,040	1,600	---
1947	8,000	10,950	28,560	2,100	14,400	11,000	4,800	3,325	9,555	5,000	3,510	1,700	---
1948	49,350	41,250	65,925	7,600	54,860	23,100	9,000	4,950	24,955	18,720	4,715	1,100	---
1949	18,050	27,360	30,600	4,620	33,810	13,260	8,580	5,168	12,825	8,750	2,000	---	17,905
1950	26,000	33,440	43,050	4,420	40,560	32,000	16,500	11,375	16,837	16,250	3,638	---	17,230
1951	24,700	36,080	46,360	4,278	22,540	15,000	15,000	4,100	24,056	12,350	1,445	---	19,690
1952	30,000	57,750	42,000	6,720	49,350	22,400	26,400	9,758	16,616	5,700	1,440	---	24,363
1953	35,700	74,400	57,750	5,950	53,940	22,500	30,625	6,724	38,259	2,700	3,900	---	52,749
1954	32,120	57,000	35,700	6,400	43,500	9,200	18,900	5,580	13,760	1,500	1,400	---	17,330
1955	37,125	58,900	33,000	5,950	33,600	17,500	12,650	3,680	16,900	800	2,400	---	20,830
1956 <sup>2</sup>	43,700	88,000	48,300	8,800	36,400	25,000	19,250	4,410	28,026	800	4,972	---	17,580
Average 1945-54	30,260	44,268	42,302	4,993	49,154	19,766	19,386	6,646	19,187	11,510	3,899	---	24,878

See footnotes for table 2.

The acreage, yield, production, and average price of popcorn for the entire country during 1944-56 are shown in table 5. Production has varied widely from year to year in response to fluctuations in both acreage and yield.

## Diseases and Insects

The diseases and insects that injure field corn attack popcorn also. The more important diseases are smut; root, stalk, and ear rots; and leaf blight. Although ear rots are not particularly prevalent in popcorn, they are serious when they do occur, as they injure the quality of the product unless damaged ears are sorted out before shelling.

The more important insect pests attacking popcorn in the field are the European corn borer, the corn earworm, corn rootworms, chinch bugs, and cutworms. The same control measures used with dent

corn are applicable also to popcorn.<sup>2</sup>

Probably the most serious insect pests in popcorn in storage are the group that includes among others the Angoumois grain moth and the rice weevil. They are worse in the South than in the North, and in many Southern States they may infest the crop before it is harvested. Except for local markets, growers in areas where insect damage is usual and severe cannot hope to compete with those in areas where it is negligible.<sup>3</sup>

<sup>2</sup> For information on the control of insects attacking popcorn, see Farmers' Bulletin 2084, The European Corn Borer and Its Control; and U. S. Dept. Agr. Leaflets 391, The Southern Corn Rootworm: How To Control It, and 364, Chinch Bugs: How To Control Them.

<sup>3</sup> For information on the control of grain-storage insects, see Farmers' Bulletin 1260, Stored-Grain Pests; or write to Stored Product Insects Section, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C.

TABLE 5.—*Acreage, yield, production, and season average price, received by farmers, of the popcorn crop of the United States, 1944-56*<sup>1</sup>

Year	Acreage planted	Acreage harvested	Yield per acre	Production	Price per 100 pounds
	<i>Acres</i>	<i>Acres</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Dollars</i>
1944-----	182, 400	174, 800	1, 343	234, 747, 000	3. 77
1945-----	337, 000	309, 900	1, 356	420, 080, 000	3. 69
1946-----	158, 300	154, 400	1, 620	250, 152, 000	3. 51
1947-----	87, 000	83, 500	1, 232	102, 900, 000	4. 72
1948-----	163, 800	160, 200	1, 907	305, 525, 000	4. 33
1949-----	118, 610	115, 800	1, 580	182, 928, 000	3. 23
1950-----	156, 710	154, 400	1, 692	261, 300, 000	3. 16
1951-----	164, 700	146, 000	1, 545	225, 599, 000	4. 34
1952-----	202, 100	185, 500	1, 577	292, 497, 000	4. 44
1953-----	242, 200	225, 900	1, 705	385, 197, 000	3. 75
1954-----	168, 500	161, 800	1, 498	242, 390, 000	2. 93
1955-----	157, 200	150, 700	1, 615	243, 335, 000	3. 07
1956 <sup>2</sup> -----	179, 000	171, 900	1, 892	325, 238, 000	2. 74

<sup>1</sup> See footnote 1, table 2.

<sup>2</sup> See footnote 3, table 2.

U.S.A.

WILSON

RECORD

NOV 6 '68

PROCUREMENT SECTION  
CURRENT SERIAL RECORD